

Title: Comparing a current-carrying circular wire with polygons of equal perimeter: Magnetic field versus magnetic flux

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Abstract: We compare the magnetic field at the centre and the self-magnetic flux through a current-carrying circular loop, with those obtained for current-carrying polygons with the same perimeter. As the magnetic field diverges at the position of the wires, we compare the self-fluxes utilizing several regularization procedures. The calculation is best performed utilizing the vector potential, thus highlighting its usefulness in practical applications. Our analysis answers some of the intuition challenges students face when they encounter a related simple textbook example. These results can be applied directly to the determination of mutual inductances in a variety of situations.

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